

TOPSAT: The Global Topography Mission

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An accurate description of the surface elevation of the Earth is of fundamental importance to many branches of Earth science. For example, continental topographic data are required for studies of hydrology, ecology, glaciology, geology, geomorphology, and atmospheric circulation,

In 1990, the NASA-Italian Space Agency Joint Topographic Science Working Group recommended a dedicated space mission as the best way to obtain a global, uniform high-quality topographic data set. The Global Topography Mission (GTM) would include an interferometric synthetic aperture radar (INSAR), a Multi-Beam laser Altimeter (MBLA), and a Global Positioning System (GPS) receiver. The INSAR will obtain a global digital elevation data set in less than 6 months, with high spatial resolution (30 m) and high vertical accuracy (less than 5 m). The MBLA will obtain a globally distributed grid of narrow altimeter swaths (5 beams cross-track with 30 m diameter footprints) of very high vertical accuracy (less than 1 m in low-relief terrain) for verifying the geodetic control of the INSAR data, for mapping of the polar ice sheets, and for measurement of vegetation height and surface roughness in selected areas. The GPS data will provide accurate (~ 10 cm) spacecraft orbit determination to ensure that the elevation data are acquired in a consistent, Earth center of mass reference frame. Other potential experiments that could be conducted with GTM include measurement of cm-scale topographic changes with differential interferometry and motion detection (e.g. of ocean currents) with along-track interferometry. The Global Topography Mission can be accomplished within the framework of NASA's "Earth Probe" program and be ready to launch in the 1998-2000 time frame.

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